ISD Decision Analysis and Resolution

Number: 580-SP-038-001
Effective Date: August 23, 2005
Expiration Date: August 23, 2010

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Title: ISD Decision Analysis and Resolution

Asset Type: Sub-process
PAL Number: 2.1.1

Purpose

The purpose of this sub-process is to define the steps required to plan and conduct a formal evaluation. The formal evaluation process may be used at any point in the life-cycle of a project whenever a formal decision is needed, for example COTS evaluation and selection.

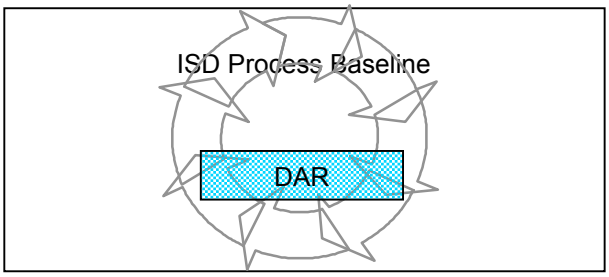
Scope

This sub-process is applicable to all life-cycle phases of all ISD mission software projects at the discretion of the Software Manager.

Guidance: The Software Project shall acknowledge conformance to this sub-process in Software Management Plan. The Software Project may wish to establish further entry criteria.

Context Diagram

Decision Analysis and Resolution (DAR) is integrated with all other processes.



Roles and Responsibilities

Product Development Lead (PDL):

Initiates the process.

Development Team Lead(s):

Supports the PDL in executing this process.

Usage Scenarios

This process is entered at any point when a formal decision making process needs to be followed. In particular, there are four usage scenarios:

- When a decision is directly related to medium or high risk
- When a decision would cause schedule delays in excess of a defined schedule variant
- When a decision adversely affects ability to achieve commitments

	• When the costs of the formal evaluation process are reasonable when compared to the costs of a decision's possible negative impact.
Inputs	The need for a formal decision as determined by the PDL with input from Development Team Leads or Team Members.
Entry Criteria	Criteria for determining when to use formal evaluation include the following: a) When there is a clear definition of an issue requiring a decision b) When there is a reasonable assumption that more than 1 valid option exists c) Documentation of PDL approval to initiate process *Guidance: The PDL should use this process:* • *When a decision is directly related to high risk* • *When a decision could cause significant schedule delays* • *When a decision could cause significant cost overruns* • *When a decision affects our ability to achieve commitments* • *When a decision is regarding major architecture choices* • *When the costs of the formal evaluation process is acceptable when compared to the costs of a decision's possible negative impact* • *The Software Project may consider establishing further specific criteria.*
Exit Criteria	All outputs are required and the following: • Documentation of PDL of decision reached and basis for decision
Output	Evaluation Plan – if the PDL considers the effort significant enough to warrant Completed DAR Record as defined in Appendix A.
Major Tasks	The PDL shall perform sequentially and iteratively as necessary: 1. Plan the Formal Evaluation 2. Monitor and Track Progress 3. Develop and Assess Criteria 4. Identify and Document Alternative Solutions 5. Select Evaluation Method 6. Evaluate Alternatives 7. Select an Alternative *GUIDANCE: The Development Team Leads have secondary responsibility and support the PDL in each of the Major Tasks.*
Task 1:	**Plan the Formal Evaluation** *GUIDANCE: Scale your approach to obtaining a decision/solution to fit the potential impact of making a poor selection.* a) Assign someone to lead the evaluation b) Document the scope of the formal evaluation

1. Identify exactly what the evaluation is to solve
2. Define known data – criteria, alternatives, issues, limitations (cost, schedule and/or resources), constraints, prior studies, past decisions, stakeholders, secondary impacts

c) Establish initial schedule for the evaluation

d) Identify and assign the initial resources required

e) Identify and inform stakeholders.

GUIDANCE: Stakeholders may be:

1. *Person who requested and/or funded the evaluation*
2. *Persons who will use/be affected by the resulting decision*
3. *Evaluation lead and team members*
4. *Verification team*
5. *Persons who will examine the solution implementation later*

f) Define the DAR data that will be collected during the evaluation.

GUIDANCE: Possible DAR data includes:

1. *Cost and schedule of performing the formal evaluation*
2. *DAR data associated with the evaluation activities*
3. *Rankings of alternative solutions against specified criteria, including total scores.*
4. *Risk exposure before and after the formal evaluation process was applied.*

g) Based on the cost, schedule, performance, and risk impact, document the rational/justification for performing a formal evaluation, and decide on the level of formality required to document the decision.

GUIDANCE: The rational/justification for performing a formal evaluation may be captured as a white paper, trade study, slide presentation, report or other mechanism.

h) Gain approval for the plan from relevant stakeholders.

i) Plan for management oversight checkpoints.

GUIDANCE: For a short study, this may be a report at the next stakeholder meeting. For a long-term project, this may include an interim progress review and a formal final review.

j) Include a strategy for adjudication of interim issues and an escalation path for resolution.

k) Select the method of configuration management for the evaluation work products that are appropriate to the formality of the decision.

GUIDANCE: Less formal decisions may be simple location/version control. More formal decision documentation may require configuration management by the Configuration Management organization.

Task 2: **Monitor and Track Progress**

a) Maintain the plan and track status as the evaluation process is performed.

b) Collect the DAR data identified in the plan.

Task 3: **Develop and Assess Criteria**

a) Develop the evaluation criteria to be used when evaluating decision alternatives.

GUIDANCE: Consider solution costs, risks, technology limitations, and

impact on established baselines and/or operational functions.

b) Map criteria to requirements, operational scenarios, and/or business cases.

c) Coordinate with stakeholders to ensure their needs, objectives and priorities are met.

d) Document the rationale for the selection or rejection evaluation criteria.

e) Define the range and scale of values for the evaluation criteria. Scales of relative importance should be established for criteria with non-numeric values or formula can be established to convert the non-numeric value to a numeric.

f) Establish a ranking for each criterion relative to each other. Use the defined range and scale to reflect the needs, objectives, and priorities of the stakeholders.

g) Assess the evaluation criteria, range and scale of values, and rankings with the stakeholders that will be impacted by the decision-making results.

GUIDANCE: Verify that the evaluation criterion meets the following guidelines:

1. *Alternatives are differentiated meaningfully*
2. *Related directly to the purpose of the evaluation*
3. *Be stated as broadly as possible*
4. *Be measurable or estimated at reasonable cost*
5. *Be independent of each other*
6. *Be understood properly by those evaluating the alternatives*

h) Incorporate changes resulting from the assessment.

Task 4: **Identify and Document Alternative Solutions**

a) Conduct literature searches, interview stakeholders, conduct brainstorming and working group sessions, and combine key attributes of existing alternatives to generate the additional alternatives.

b) Document identified alternatives, indicate which will be considered and include rationale for those included and rejected.

Task 5: **Select Evaluation Method**

a) Select the evaluation methods to be used for making a decision(s). Select the method that best focuses on the issues.

GUIDANCE: A minimum of one method must be selected. Two or even more may be indicated if the consequences of a poor decision are high. Consider the impact of the decision-making method on cost, schedule, performance, and risk when selecting the technique.

1. *Cost Study/Cost Model*
2. *Simulation/Prototype*
3. *Engineering/Benchmark/Trade Study*
4. *Manufacturing Study*
5. *Business Opportunity Study*
6. *Extrapolation based on experience/study*
7. *User Review and Comment*

8. *Testing*
9. *Data Comparison*
10. *Feature Comparison*
11. *Decision Tool (e.g.,tool for monte carlo simulation for distribution of uncertainty in choices)*
12. *Modeling Tool*
13. *Other methods*

b) Update the evaluation plan, collect DAR data, conduct stakeholder review, and obtain stakeholder and management approve to proceed.

Task 6:

Evaluate Alternatives

a) Evaluate the alternatives against the evaluation criteria. Use iterative analysis cycles as necessary.
b) Substantiate scoring and conclusion through method(s) selected in step 5.
c) Identify any unknowns, guesses, or assumptions made about the solution meeting evaluation criteria and document observations that support or disprove those assumptions.
d) Identify new alternatives if all current alternatives prove unsatisfactory and conduct evaluations of those alternatives.
e) Update evaluation plan, as needed.
f) Document evaluation results, including any unsatisfactory alternatives. Include rationale for additions of new alternatives and any changes to criteria.

Task 7:

Select an Alternative

a) Select the most favorable alternative.
b) Identify risks associated with selecting the solution.
c) Document the selected alternative, associated risks, and rationale for selection.
d) Review evaluation results and selected alternative with Stakeholders.
e) Gain approval for the recommended solution with stakeholders and management.
f) Collect identified DAR data.

Measures

Recommended Measures:

- Actual effort spent (cost and schedule) on the decision and selection process

Tools and Templates

Name	Description
Decision Analysis and Resolution Record (Form)	Provides a template for the activities to be performed and a convenient form for capturing the results and required Quality Record

Training

Course Name	Description
Software Project Management	Week long project management class. Course ID HQ0005

References

- **Glossary:** http://software.gsfc.nasa.gov/glossary.cfm
  Defines common terms used in ISD processes
- **Process Asset Library:** http://software.gsfc.nasa.gov/process.cfm
  Library of all ISD process descriptions

Quality Management System Records

Controlled Document / Description	Record Custodian
Controlled Doc Name: Evaluation Plan (if developed)	**PDL**
Controlled Doc Name: Completed and signed DAR Record (Form)	**PDL**

Change History

Version	Date	Description of Improvements
1.0	8/23/05	Initial approved version by CCB

DAR Effort Lead:	Telephone:
E-mail:	Project Repository:
PDL:	Telephone:
DAR Scope:	
DAR Constraints:	
DAR Formality: Formal DAR Size: ☐ Small or Medium ☐ Large	Estimated Effort: <Staff months> Estimated Cost: Current Schedule Location:
Start Date:	Scheduled Completion Date:
DAR Plan Necessary (Y/N):	DAR Plan Approval Date:
Configuration Management of DAR Record and Artifacts: ☐ Version Controlled ☐ Reviewed by CM	Identify Location of artifacts:
Indicate Required Reviews: ☐ Initial Plan Review ☐ Alternative Solutions Stakeholder Review	☐ Evaluation Method Stakeholder Review ☐ Select Solutions Stakeholder Review
Indicate Required Metrics: ☐ Cost ☐ Effort ☐ Evaluation Criteria Volatility	☐ Review Actions Opened / Closed / Late ☐ Criteria Ranking ☐ Solution Scores
Indicate Additional Resources Required: _____ _____	_____ _____
Evaluate Criteria (select one or more) ☐ Technical Limitation ☐ Time Limitation ☐ Resource Limitation ☐ Total Ownership	☐ Life Cycle Cost ☐ Environmental Impact ☐ Risk ☐ Other _____

Alternative Solutions: 1. _____ 2. _____	3. _____ 4. _____
Alternative Solution generated by: ☐ Stakeholders ☐ Working Group ☐ Subject Matter Expert(s)	☐ Literature Search/Research ☐ Steering Committee/Corporate ☐ Other: _____
New Tool or Technology Required?	☐ Yes ☐ No
Evaluation Method(s): (a) Simulation/Prototype (b) Engineering/Benchmark/Trade Study (c) Manufacturing Study (d) Cost Study/Cost Model (e) Business Opportunity Study (f) Extrapolation based on experience/study (g) User Review and Comment (h) Testing (i) Data Comparison (j) Feature Comparison (k) Decision Tool (l) Modeling Tool (m) Other:	Alternative Rankings 1 2 3 4 ☐
Evaluate Alternatives: Indicate Scoring Method which includes factor for Risk in Implementing Alternative: (Suggested method is to rank from alternatives as 1=best through 4=worst and multiply by risk factor 1=low risk, 2=medium risk, 3=high risk or describe other method))	Alternatives: 1 2 3 4 Score: Risk Factor: Final Score:
Select Alternative Solution: (Select the alternative that had the lowest (best) score. If tie, select the lowest risk alternative)	Alternative Chosen:
Rational for Solution Selected (attach additional sheets if necessary):	
Approvals:	
DAR Lead:	
Develop Team Lead(s) (as appropriate):	
PDL:	